## Abstract

This work introduces a new generation HBOC, OxyVita®. The product's foundation lies in zero-link polymerization technology, which ensures: lack of toxicity, structural stability, optimal molecule size to prevent extravasation and related vasoconstriction and blood pressure increases, protection against autooxidation, and maintenance of the heme-iron moiety in a reduced state necessary for hemoglobin's oxygen delivery function. OxyVita's low p50 enables efficient oxygen delivery and rapid release exclusively in the microcirculation.

The work discusses the zero-link polymerization technology and the development of analytical methods to assess the physicochemical characteristics of OxyVita®. The product's characteristics are summarized and analyzed in terms of their impact on its behavior in animal studies, primarily to determine if OxyVita® performs as intended and predicted in its role as an oxygen-carrying therapeutic. Additionally, a report of published studies to date is provided, along with a description of unpublished experiments. Together, these findings offer a comprehensive evaluation of OxyVita®'s medicinal potential.

Further, several potential new medical applications for OxyVita® are proposed, and the background for the considered medical conditions and the rationale for using this product as a treatment or adjuvant therapy are provided. This work presents a pioneering approach to treating certain conditions that currently lack definitive or satisfactory treatment options in modern medicine, such as the third phase of cardiac arrest, carbon monoxide poisoning, or support of aerobic metabolism in ex-vivo organs. Initial results from in vitro studies conducted to validate these concepts are also presented. Trials aimed at developing a replacement for donated platelets are described, with the goal of obtaining a separate dried platelet product and combining it with OxyVita® to simulate the characteristics of whole blood. The work presents compatibility and optimization studies conducted for these experiments.

The objective of this work is to provide a summary of the existing knowledge on OxyVita® and analyze its performance capabilities based on its physicochemical and structural attributes. The product appears to perform as intended based on the studies conducted thus far. Therefore, the collection and presentation of these data may facilitate further development of new products in the field of blood substitutes.



**Key words**: OxyVita®, zero-link polymerization technology, oxygen carrier, blood substitute, HBOC.


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